

Typhoon, July 6-16, 1940.—A well-developed typhoon appeared about 300 miles south of Guam, July 6, moved northwest, then west-northwest, and inclined to the north when the center reached the ocean regions about 500 miles east of northern Luzon. This northerly course soon became north-northwest, and the storm moved into the Eastern Sea, passing about 60 miles west of Naha, Nansei (Loochoo) Islands. Recurvature took place over the central part of the Eastern Sea and the center soon reached the Sea of Japan on its way to the northern Pacific Ocean.

The steamship *Coldbrook* experienced the strength of this typhoon and sent many observations to Manila on July 11 as the center passed close to and east of the ship. Of these observations, that with the lowest pressure was made at 0400 GMT (noon, Manila time), latitude 21.6° N., longitude 128.5° E., 959.0 mb. (719.3 mm.) with west-northwest winds of force 12.

The upper winds during the period of the three storms just described showed their greatest activity over the Philippines, Indochina, and Thailand from July 4 to 13 approximately. The depression late in June was a manifestation of a quiet advance of the southwesterly current from Thailand and Indochina (and very likely from the Straits Settlements, but only scattered observations are at hand at the present writing) to the Philippines and the Pacific. The approach of the typhoon, July 2 to 9, intensified this current over Cebu, Manila, Dagupan, and Aparri, velocities of 100 k. p. h. and over being reported a few times. Zamboanga, however, did not seem to feel the effect of this strength, the velocities reaching 50 k. p. h. only infrequently. The typhoon, July 6 to 16, maintained these high velocities until about July 12 or 13, after which they diminished gradually as the storm center reached the Eastern Sea. There was no special activity in the east quadrant current at Guam during these days, as far as can be ascertained from available observations.

Typhoon, July 12-25, 1940.—This storm center moved northwesterly from the ocean regions far to the south-southeast of Guam to the latitude of southern Formosa where it changed to the west. It recurved to the northeast when within 100 miles of Formosa, but followed a northerly course into the Eastern Sea. Korea (Chosen) was crossed and the typhoon rapidly moved northeast over the Sea of Japan and beyond.

Until this typhoon reached the locality of Formosa and the Eastern Sea, it did not manifest the power that it seemed to have when it passed west of Guam. Observations from Ishigakijima, Nansei (Loochoo) Islands, showed that the center was deep, but exerting its influence only nearby and not at a distance. The 2 p. m. observation of July 21, from this island station had 739.0 mm. (985.3 mb.) with east-southeast winds, force 8, as the center moved northerly along a course about 60 miles west of the station.

Typhoon, July 25-29, 1940.—Forming about 500 miles east-northeast of San Bernardino Strait, this typhoon moved in a west-northwesterly direction, and crossed Balintang Channel and the northern part of the China Sea on its way to the continent. It passed over the coast line between Hong Kong and Swatow and disappeared over the interior on July 29.

The steamship *Kujawa Maru* reported from latitude 18°20' N., longitude 124°30' E., a pressure of 695 mm. (926.6 mb.) with north-northeast winds of force 12, July 26, at noon. As the typhoon crossed Balintang Channel, neither Basco nor Aparri had any extremely low pressures or strong winds, indicating that the storm had weakened or was small in area.

Typhoon, July 29-August 4, 1940.—For some time before July 29, there was a low-pressure area east of the Philippines but no definite center appeared until July 29, when it was certain that a typhoon was in existence about 600 miles east of Basco. This center moved northwest, passed about 60 miles southwest of Naha and later about 60 miles northeast of Shanghai, moving in a northerly direction almost parallel to the coast line. It crossed Shantung Peninsula on August 2, but there seemed to be traces of the circulation over northern China and Manchuria on August 4.

Observations from the steamship *Hybert* indicated the existence and movement of this storm, July 29 and 30. From latitude 24°0' N., longitude 128°0' E., the value of 994 mb. (745.5 mm.) with west winds, force 9, was reported (July 30, 6 a. m. Manila time), this being the lowest pressure value in the series of observations from this vessel. Naha, Nansei (Loochoo) Islands, on July 30, 2 p. m. reported pressure at 743.0 mm. (990.6 mb.) with east-northeast winds, force 5. The next day at 6 a. m., the steamship *City of Norfolk*, position in latitude 28°12' N., longitude 125°30' E., had pressure at 973 mb. (729.8 mm.) with east-southeast winds of force 8.

The last three typhoons of the month should be characterized as small, exerting their influence over a small area. Compared with the two in the first half of the month, very little, if any of the activity which they manifested was found after July 15. Over the Philippines, the upper winds, southwest quadrant prevailing, hardly reached values above 40 k. p. h. Usually, it might be mentioned, there was an easterly current above the southwesterly current, the high clouds showing this often and the balloons entering it a few times. Thailand and Indochina pilots showed a weaker southwesterly current during the last half of the month. Guam did not have any strong east quadrant winds, and when the southwesterly current reached that locality for a few days the velocities were always weak. This month is interesting because of these two types of typhoons, the larger during the first half, the smaller during the latter half, and moving over similar courses.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

During July severe flooding was confined to the Black Warrior, Tombigbee, Pearl, and Pascagoula River Basins in the East Gulf of Mexico drainage, and the lower Colorado and Guadalupe Basins in Texas. Record rainfall in central and southern Texas on June 29-30, ranging from 8 to 22 inches over a small area, resulted in the floods in the Texas area which were most destructive in the upper Lavaca River. In the east Gulf area rainfall was almost continuous over a much longer period, lasting from June 29 to July 20 with only a few interruptions.

East Gulf of Mexico drainage.—Moderate flooding occurred in the lower portions of the Apalachicola River, when the stage at Blountstown, Fla., exceeded flood stage by 3.5 feet on July 14. The Choctawhatchee River just reached flood stage on the 10th at Caryville, Fla.

Rains were heavy over the Black Warrior and Tombigbee Rivers on July 2 and 3, causing sharp rises on the 3d. Heavy showers occurred over the upper parts of both basins every day except one, from the 3d to the 15th. The Black Warrior at Tuscaloosa, Ala., had three rises and the upper Tombigbee at Aberdeen and Columbus, Miss., had two, during the flood period. In the lower portions

Along the lower Colorado River, La Grange, Tex., had 12 inches of rainfall during a period of 29 hours; Smithville had 20.40 inches from the afternoon of June 29 to the morning of the 30th, with 16 inches of this amount falling between 7 p. m. and 10 a. m.—a period of 15 hours. The river did not reach flood stage at Smithville, Tex., but rose to 10 to 12 feet above flood stage from Columbus to Wharton, Tex.

Along the Guadalupe River Basin, rainfall at San Marcos, Tex., measured 6.18 inches; Cuero, Tex., 14.40 inches, with 12.40 inches of this amount falling during the 24 hours ending at 7 a. m., June 30. Further downstream, Gonzales, Tex., had 5.98 inches. The river rose 10 feet above flood stage at Gonzales, and 9.5 feet above flood stage at Victoria, Tex., with the crest passing Gonzales on July 1 and Victoria on the 3d.

The upper watershed of the small Lavaca River was subjected to an excessive rainfall of unusual intensity and duration, and over parts of that section 22 inches of rainfall occurred within 36 hours, June 29-30. Hallettsville, Tex., approximately 20 miles below the headwaters of the Lavaca River, experienced the most costly flood in its history. It was here that seven persons were drowned, and property losses including crops and washed farming lands exceeded \$740,000.

The Nueces River reached flood stage from July 2 to 5, inclusive, but no losses occurred.

FLOOD LOSSES FOR JULY 1940

River and drainage	Tangible property	Matured crops	Prospective crops	Live-stock and other movable farm property	Suspension of business	Total
EAST GULF OF MEXICO DRAINAGE						
Apalachicola River.....					\$4,000	\$4,000
Choctawhatchee River.....	\$3,000	\$40	\$300	\$100	4,000	7,440
Black Warrior - Tombigbee Rivers.....	200,000		3,985,000		33,000	4,218,000
Pearl and Pascagoula Rivers.....	120,000	80,000	240,000	13,000	46,000	499,000
UPPER MISSISSIPPI BASIN						
Wisconsin River ¹	5,743	4,277	13,463		13,363	36,846
Zumbro River.....			5,000			5,000
WEST GULF OF MEXICO DRAINAGE						
Colorado River.....	76,000	66,000	8,000	2,000		152,000
Guadalupe River.....	60,000	95,000	16,000	8,000		179,000
Lavaca River.....	200,000	140,000	315,000	85,000		740,000
GULF OF CALIFORNIA DRAINAGE						
Pinal Creek (tributary of Salt River).....	50,000					50,000
Tributaries of Little Colorado River.....	3,000	1,500		500		5,000

¹ Late in June and early in July.

FLOOD-STAGE REPORT

[All dates in July unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
EAST GULF OF MEXICO DRAINAGE					
Apalachicola: Blountstown, Fla.-----	<i>Feet</i> 15	8	24	<i>Feet</i> 18.5	14
Choctawhatchee: Caryville, Fla.-----	12	10	11	12.0	10-11
Cahaba: Centerville, Ala.-----	23	15	15	24.2	15

FLOOD-STAGE REPORT—Continued

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
EAST GULF OF MEXICO DRAINAGE—CON.					
Black Warrior:					
Lock No. 10, Tuscaloosa, Ala.....	46	{ 4 10 14	{ 4 14 17	{ 46.1 49.0 51.0	{ 4 13 16
Lock No. 7, Eutaw, Ala.....	35	6	23	47.2	19
Tombigbee:					
Aberdeen, Miss.....	34	15	16	34.0	15-16
Columbus, Miss.....	29	5	6	30.2	5
Gainesville, Ala.....	36	7	25	46.7	16
Lock No. 4, Demopolis, Ala.....	39	6	27	56.9	20-21
Lock No. 3.....	33	5	30	56.9	21-22
Lock No. 2.....	46	7	29	58.1	22
Lock No. 1.....	31	7	(¹)	38.6	25-27
Leaf: Hattiesburg, Miss.....	18	9	13	19.5	11
Chichasawhay:					
Enterprise, Miss.....	20	10	13	22.3	11
Shubuta, Miss.....	26	5	21	{ 31.5 29.0	{ 15 20
Pascagoula: Merrill, Miss.....	22	10	20	24.3	14-15
Pearl:					
Edinburg, Miss.....	20	9	18	23.7	13
Jackson, Miss.....	18	7	31	32.0	19
Monticello, Miss.....	15	{ 6 19	{ 19 31	{ 21.8 19.5	{ 9 22-23-24
Columbia, Miss.....	17	8	31	{ 22.5 19.0	{ 12 26
Pearl River, La.....	12	9	(²)	15.7	17
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Zumbro: Thellman, Minn.....	35	11	11	36.7	11
Mississippi: Louisiana, Mo.....	12	(³)			
Missouri Basin					
Republican: Guide Rock, Nebr.....	9	2	2	9.1	2
Arkansas Basin					
Cimarron: Perkins, Okla.....	11	3	4	11.5	4
North Canadian: Yukon, Okla.....	8	2	6	9.2	4
Red Basin					
Ouachita: Camden, Ark.....	26	4	7	28.4	6
Little: Whitecliffs, Ark.....	25	3	7	27.1	4-5
Sulphur:					
Ringo Crossing, Tex.....	18	{ (¹) 12	{ 7 16	{ 26.9 22.6	{ 2 13
Naples, Tex.....	22	3	12	26.5	6
Lower Mississippi Basin					
Coldwater: Coldwater, Miss.....	13	June 29	2	14.6	June 30
WEST GULF OF MEXICO DRAINAGE					
Trinity:					
Dallas, Tex.....	28	2	6	32.4	4
Trinidad, Tex.....	28	4	16	33.4	13
Colorado:					
Columbus, Tex.....	24	June 30	3	36.3	1
Wharton, Tex.....	26	1	4	36.0	3
Guadalupe:					
Gonzales, Tex.....	20	June 30	2	30.0	1
Victoria, Tex.....	21	(¹)	6	29.5	3
Nueces: Three Rivers, Tex.....	37	2	5	37.9	3

¹ Continued from preceding month.

² Continued into next month.

³ Occasionally at or above flood stage due to operations of Dam No. 24.